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# Introduction to the Special Issue of Applied Occupational and Environmental Hygiene

Robert F. Phalen and Jeffrey S. Lee

After the First Colloquium on Particulate Air Pollution and Health, which was held at the Arnold and Mabel Beckman Center of the National Academies of Sciences and Engineering (January 1994, Irvine, California), it was clear that several important issues concerning the health-related impact of particulate materials needed further examination. In addition, it was realized that increased communication among researchers, regulators, and the regulated community, along with a better definition of the highest priority research, was also needed. Accordingly, an organizing committee consisting of knowledgeable scientists from diverse disciplines was formed to define the format and technical content of a second colloquium. This organizing committee consisted of Dr. J.S. Lee (University of Utah), Dr. R.F. Phalen (University of California), Dr. C.A. Pope III (Brigham Young University), Dr. S.B. Prasad (South Coast Quality Management District, California), and Dr. A.J. Cohen (The Health Effects Institute). The committee selected Park City, Utah, as the venue; May 1-3, 1996, as the time; and eight major topical areas relating to particulate materials as the focus of the program. The topical areas were: Investigational Methods, Their Strengths and Limitations; New Epidemiological Findings; Mechanisms for Health Effects; Deposition and Clearance of Inhaled Particles; Exposure Assessment and Sampling Issues; Indoor, Occupational, and Total Exposures; Research Strategies; and Science and Public Policy. Announcements of the meeting drew an enthusiastic response from the scientific, regulatory, and industrial communities. Almost 200 individuals from 10 different countries attended. More than 100 papers were presented, and support was obtained from 11 sponsors, including the Centers for Disease Control and Prevention/National Institute for Occupational Safety and Health as the primary sponsor. The final program included 20 separate sessions and a precolloquium workshop on research strategies. This special issue of *Applied Occupational and Environmental Hygiene* contains papers that were submitted and passed peer review, including the precolloquium workshop by Dr. Morton Lippmann *et al.*

The colloquium served as an update on a large and complex topic, and it defined areas of uncertainty which will require additional research. It is not possible to succinctly summarize the material that was presented during the 3-day meeting; this special issue, in part, serves that purpose. However, some overall observations can be made. First, the epidemiological associations relating particulate matter exposures of the general public to adverse health effects were largely verified, although the increase in apparent relative risk is extremely low; however, the causal agents, the critical exposure period, the specific affected human subpopulations, and the exact causes of the mortality and morbidity still remain unknown. The relative contributions of particles, associated copollutants, and other

factors associated with air pollution episodes are still being debated and actively investigated. The principal related question, "What is the proper metric for adverse health effects?", emerged as a major unresolved concern. The question is complex when one considers the labile nature of collected air samples, and even of the air pollutant mix itself. Volatile, short-lived, and very reactive species are as yet poorly understood with respect to their levels in the air, their deposition and fate in the respiratory tract, and their effects on health.

Another major unresolved issue that emerged relates to how health-compromised individuals might differ from healthy people in their dosimetric characteristics and adverse responses to air pollutants. Clearly, susceptible individuals are at increased risk, but such questions as temporal significance remain unclear. Both new types of epidemiological and clinical investigations and new types of toxicological studies are needed. Several times, a partnership between epidemiology and toxicology was suggested as being the best, and possibly only, approach to finding the answers that are required to protect the public's health.

A portion of the meeting was devoted to exploring the ways in which knowledge related to occupational particulate exposures could shed light on environmental exposure questions, and vice versa. Although there are clear differences in these exposed populations and their exposures, greater integration of knowledge from these two scenarios was recommended. Follow-up studies of retired, previously heavily particle-exposed workers, as well as cardiopulmonary-compromised current workers, would be of special value.

Interesting discussions and earnest debates over the issue of medical plausibility occurred at the colloquium. The issue can be stated as, "What criteria must be met in order to establish that low levels of particulate exposure are actually causing significant human mortality and morbidity?" It was clear that substantial disagreement exists as to the answer. On one hand, a nearly formal proof might be demanded. This proof would consist of a tight chain of events from the initial inhalation exposure, tracing through known pathophysiological mechanisms, to a conclusion that the result is inevitable significant harm capable of producing death and/or disease. Such a proof would require substantial input from well-conducted laboratory investigations. On the other hand, some participants believed that the existing reproducible epidemiological associations were already sufficient to establish plausibility and a causal relationship. It is anticipated that this question will continue to be actively debated.

The articles in this issue have been revised in response to peer reviewers' comments, so they differ from versions published in the colloquium proceedings, which also contains papers not submitted for peer review.

### **Acknowledgments**

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